Subject Index

Acetabularia 3-6, 9, 10, 12, 19, 21-25
Acheta domesticus 82, 89, 90, 92, 94
acrophase def. 345
adaptive significance 111, 158
adjustment 170, 174, 179-181, 185, 197-199, 202, 214
advance 178
agriculture 31, 37
aldosterone 169, 219, 225, 236, 338
ambulatory monitoring 335, 341, 343
amplitude def. 345
anatomical locus 1, 2, 4
angiotensin 219, 225, 236
Anthernea pernyi 91
antimetabolite 262, 282
Apis mellifica 84, 86
Aplysia 2, 6, 11, 14, 23, 56, 57, 61, 62
autocrine signaling 319

bamboo, rhythms of 32, 36
basal retinal neuron 11, 55, 60
basic rest-activity cycle 113, 323
beta-blockers 219, 346, 347
Blaberus craniifer 68
blood flow 115, 117, 219, 222, 223, 298, 301, 350
blood pressure 115-117, 219-222, 225, 232-236, 335-339, 341-352
blood volume 221, 222
body temperature 102, 103, 150, 155, 156, 164, 166, 167, 168, 169, 175-176, 250, 359-360, 377
brain temperature 149, 154-156, 158
bright light 137, 140, 143, 156, 167, 199, 375
brush border enzymes 308
Bryophyllym 23
Bulla 2, 6, 11, 12, 14, 55-58, 60, 61, 63-64

calcium 6, 11-13, 21-23, 55, 60, 62-64, 219, 233
calcium channel blocker 63, 64, 219, 233
calcium flux 55, 63, 64
calcium-calmodulin inhibitor 23
calmodulin 6, 11-13, 22-25
cAMP 6, 8, 62, 123, 132, 225, 246, 350, 355, 362
cancer 261, 263-276, 286, 287, 289-291
cancer chemotherapy 267, 269, 270, 273
cap formation 12, 23, 24
cardiac morbidity 219, 227
cardiovascular rhythms 335
cell division cycle 3, 267
cell proliferation 268, 269, 274, 309
cellular basis of the rhythm 57, 61
central nervous system 9, 67, 73, 75-77, 109, 125, 219, 349
cerebral cortex 123, 125, 127-129, 132
Chenopodium 23
Chlamydomonas reinhardtii 5, 11
chloroplast 6, 9, 10, 19, 21,

25
chloroplast membranes 21, 25
cholecystokinin 309, 310, 313
chronopharmacology 219, 227, 236-237, 309, 341, 368
chronotherapy 243, 251, 256, 263, 265, 269-271, 273-275, 281, 282, 293
chronotolerance 274
circacentuminutan def. 338, 339
circadian def. 338
circadian clocks 1, 3, 11, 89, 359, 361, 362
circadian dosing time 263, 274
circadian eclosion rhythm 7
circadian factors 197, 199, 203, 204
circadian pacemaker 6, 55-57, 60, 61, 77, 88, 90, 92, 93, 98, 100, 101, 158, 315, 369, 372
circadidian def. 338
circadiseptan def. 338, 339
circaduodecennian def. 338
circannual 34, 307, def. 338
circasemidian def. 338, 339
circasemiseptan def. 338
circaseptan 267, def. 338, 350, 351
circaseptennian def. 338, 341
circatrigintan def. 338
circavigintan def. 338
circumesophageal 69, 70, 77
circumnutation movements 33
cisplatin 261, 263, 269, 270, 272, 281, 284, 285
citrus trees 36
clock genes 6, 7, 10, 43
clock proteins 1, 6
clocks 1, 3, 7, 11, 13, 43, 89, 149, 166, 167, 170, 359, 361, 362
clonidine 219, 236
Cockroach 56, 68-71, 73, 75-77, 87, 92
locomotor activity of 81
conidiation rhythm 25
coping strategies 204, 205, 214
coronary heart disease 219, 225, 226, 228, 233
cortisol 166, 245, 246, 256, 264, 308, 326, 350, 359-362, 369-371, 375
coupled cellular oscillators 4
coupling pathways between clocks and their hands 13
courtship song rhythms 8, 44, 49
Crickets 72, 82, 84, 85, 89, 93
cyclic AMP see cAMP
cystic fibrosis 309, 349
cytostatic 261-263, 265, 266, 274

deiodinase type II activity 123, 125, 132
dehydroepiandrosterone-sulphate (DHEA-S) 326
depolarization 11, 55, 61-64
depression 137, 143, 153, 170, 199, 226, 233, 245, 357, 358, 359-376
destabilization theory 209, 210, 214
dian def. 338
diuretics 219, 234
DNA homologous to the per locus 9
DNA synthesis 265, 267, 268, 307, 309
doxorubicin 261-263, 269-271, 273, 274, 281, 284, 285, 287
Drosophila 7-11, 22, 30, 32, 43, 44, 47-52, 88, 89, 91-93
Drosophila DNA 44
Drosophila melanogaster 88
drug administration systems 270
drug delivery 237, 281-284, 286, 287, 289, 290, 292
drug-induced mucosal damage 295, 300

early morning awakening 357, 358, 360
EGTA 11, 63, 64
electrophysiological analysis 56
endocrine signaling 319
endocrinology 133, 291, 310, 319
endogenous 13, 34, 84-87, 89, 107, 109, 123, 130, 132, 139, 142, 144, 145, 163, 166-170, 174, 176-181, 183, 184, 222, 243, 250, 255, 297, 308, 310,

312, 342, 357, 360, 361, 373
endogenous factors 33
endogenous temporal regulation 183, 184
endometriosis 327
endosymbionts 13
endorphin β 325
enzymes 32, 35, 125, 138, 227, 307, 308
estradiol 326
ethylene 25
Euglena 3, 5, 11-13, 22, 26
evening types 179
exogenous 33, 84, 142, 145, 163, 166, 167, 169, 174, 176-180, 243, 249, 250, 275, 316
external signal 149
extraocular photoreceptor 88

Filestatus bambusoides 36
flowering 31-34, 37
fluorodeoxyuridine 281
follicular maturation 326
frequency responses 107
frq gene 10-12
fruit development 31, 36, 37
fruit size 36
FSH 326
fungi 19, 25

gap junctions 4, 9, 43, 52
gastric acid 295-297, 300, 301, 303, 315
gastric emptying 252, 295, 300, 309
gastric inhibitory polypeptide (GIP) 310, 315
gastrin 297, 309-313
gastrin receptors 309, 310, 312, 313
gastrointestinal peptides 307, 309
genetic transformation 43, 44
geniculo hypothalamic tract 97
geomagnetic field 84
Giardia 307
glutathione (GSH) 4
glycosylation 8, 23, 25, 48, 49
gonadotropin releasing hormone 323
Gonyaulax 3, 5, 6, 14, 23
growth 3, 12, 32-37, 76, 137, 143, 169, 261, 268, 274, 275, 281, 282, 290-292, 341, 373
Gryllus bimaculatus 77

H-type cells 60
H_2-receptor antagonist 302
harderian gland 123, 125-127, 130, 131, 133, 139
health 1, 123, 195, 198, 199, 203, 205, 209, 210, 211-214, 216, 243, 264, 301, 307, 308, 316, 335-337, 339, 345, 367
Honeybee 84, 86
hormonal coupling 92
hourglass 183-185, 191, 193
house crickets 82, 95
house fly 85, 88, 95
human platelets 4, 17
humans 137, 139, 143, 144, 168, 183, 191, 219, 222-225, 228-230, 236,295,310, 375
humoral pathway 91
Hyalaphora cecropia 91
hyperpolarization 55, 62, 64
hypertension 219, 220, 225, 228, 234, 236, 292, 337, 342, 344, 349
hypothalamus 2, 56, 77, 97, 98, 101, 103, 283, 291

immunohistochemical analysis 103
implantability 281
infradian 31, 32, 34, 36, 107, 274, 291, 337-339, 341, 343,372, 373
infradian rhythms 32, 34, 36, 107, 372, 373
insects 2, 72, 81-83, 85, 87, 92, 93, 160
insulin 310, 311, 314-316, 349
intercellular communication 4, 9, 50, 51
intercellular cross-talk 4
internal clock 163, 164, 166-168, 170
internal coincidence model 370, 378
intracellular recordings 62, 64
invertebrates 56, 63, 67, 77,

341
isolated optic lobes 73

jet-lag 144

Kalanchoe 23

lateral hypothalamic area 97, 102
leaf movement 32, 38
Lemna 13, 22, 23
Leptosphaeria 22, 24
Leucophaea maderae 68, 69, 87, 88
leukemia 262
light 1-3, 5, 11, 12, 14, 22-25, 33, 34, 37, 46, 57, 58, 60-63, 67, 69, 70, 73-75, 82, 85, 86, 87-89, 93, 97-99, 103, 123, 127-131, 133, 137, 139, 140, 141, 143, 144, 146-153, 156, 158, 163, 164, 166, 167, 170, 199, 232, 255, 265, 298, 299, 310, 311, 313-316, 339, 342, 348, 362, 365, 367, 373-376
locomotor activity 5, 44, 45, 49, 68, 70, 71, 74-77, 81, 82, 83-96, 153, 154, 274, 362
locomotor activity of insects 81
luciferase 14, 16
luteinizing hormone 321, 326

magnetic field 86
mania 367, 368, 372, 375
marine gastropods 2
masking 149-154, 156-158, 163, 164, 166-170, 174, 310, 357-361, 369
mechanisms of generation 19
melatonin 100, 123, 129, 131-133, 137-145, 164, 275, 325, 329, 350, 362, 365, 370, 371, 374, 375
melatonin synthesis 123, 131, 132, 139
menstrual cycle 282, 369, 372
mesor def. 345
methyldopa 219, 236
mitochondrial calcium cycle 11, 12
mitotic index 266-268
modulation of neuronal excitability 77
molecular genetics of 1
molluscs 56
morphometric analyses 308
multiple oscillators 68, 70
multiple pacemakers 68
Musca domestica 85, 86, 88
myocardial infarction 227, 237, 348, 349

N-acetyltransferase activity 123, 133, 135
NAD-kinase 22, 23
neurons 6, 11, 55, 56, 58-61, 74, 76, 77, 98-101, 103, 130
neuropeptide tyrosine 97, 99
Neurospora 5, 6, 10-12, 23, 43
Neurospora clock genes 10
neurotensin 311, 314, 315
night work 111, 174, 178, 209, 212, 244
night shift 179-180
night workers 180
non-vernalized plants 34
NREM-REM cycles 183
nyctohemeral rhythms 123, 127

ocular pacemakers 55, 56
oncology 261, 281, 282, 291
optic lobes 2, 68-71, 73-75, 77, 87-89, 91, 92
optic-lobe oscillator 70, 71
optic-lobe pacemaker 71, 74, 76
optic-tract regeneration 72, 75, 76
organic nitrates 219, 234, 237
oscillating metabolic network 19
oscillator 1, 3, 4, 6, 10, 12, 13, 19, 23, 25, 30, 55-57, 60, 61, 68-72, 74, 76, 81, 82, 87-91, 93, 101, 102, 149, 153, 164, 166-168, 184

pacemaker 2, 5, 6, 43, 55-57, 60-74, 76-78, 88-92, 97-98, 100-103, 150, 154, 158, 283, 315, 350, 369, 372
pacemaker modulation of neural activity 73
pacemaker organization 60
pancreatic polypeptide 99, 309, 310, 316
paracrine signaling 319
Paramecium bursaria 3
pars intercerebralis 70, 90-95
peer-group reference limits 335, 343
peptic ulcer 295
per clock gene 4, 9
per DNA 8, 48
per gene 7-9, 23, 32, 50, 89
per locus 5, 7-11, 44, 47
per protein 8, 47-51
per protein sequence 8, 48
per transcripts 50
performance 118, 179-180, 197, 198, 203, 264, 265, 284, 360
period locus 43
Periplaneta americana 90, 95
per^{l} 5, 7, 44, 47, 48, 50
per^{o} 4, 5, 7, 44, 47, 48, 50, 51, 89, 91, 95
per^{s} 4, 5, 7, 8, 44, 47, 48, 50, 51, 91
Pharbitis nil 33, 39
phase delay 178
phase shifting 55, 61-65, 87
phase shifts 6, 11, 12, 55, 58, 61-65, 149, 152, 168
phase-advance hypothesis 359, 360, 370
phosphorylation 6, 8, 23, 35, 40
photoperiod 26, 87, 130, 137, 139-144, 150, 374
photoperiodicity 137, 139
photoreceptor 1, 6, 13, 23, 58-60, 81, 82, 87, 88, 135
phototherapy 367, 368, 371-375
phytochrome research 34
phytohormone 23, 24
pineal gland 2, 123, 125-133, 137, 138, 143, 144
Pisum sativum 34
plants 10, 13, 25, 31-34, 36-39, 85, 341, 360
point mutations 7, 47
product of the per locus 8, 10
progesterone 326
proglumide 309, 310
prolactin 326, 374
protein modifications 23
protein synthesis 4, 6, 8, 19, 22-24, 50, 51
proteoglycan 8, 9, 43, 48, 49
psychoneuropharmacology 357
pulsatile secretion, epidodic 322
pump 270, 271,286, 287, 349
Pyrocystis 3

quantal cycle 1

range def. 345
Raphanus sativus 34, 41
receptor blockers 219
REM-sleep 186
renin 169, 219, 224, 225, 232
retinohypothalamic tract 97
rhythm of eclosion 91

SCN lesions 100
SCN projections 101, 102
seasonal 137, 139, 140, 142, 143, 263, 275, 295, 307, 309, 367, 368, 369, 373-375
seasonal affective disorder 367, 373
secretin 309, 310, 316
Sedum morganianumam 34
Sedum pachyphyllum 34, 39
serotonin 6, 34, 62, 128, 137, 138
serotonin N-acetyltransferase 128, 147
shiftwork 173, 181, 185, 195-207, 209-214, 216, 250
silkmoths 91
sleep 4, 109, 111-113, 115-117, 119, 139, 144, 150, 151, 166-169, 178, 183-191, 195, 197, 198, 199-205, 209-216, 221, 225, 244, 245, 249-251, 252, 262, 265, 274, 291, 341, 342, 357, 358, 359-361, 367-376
sleep debt 185, 189, 191

sleep deprivation 176, 185, 187, 359, 360, 365, 367, 368, 370, 371
sleep duration 174, 180-181, 185
sleep factors 198, 199, 203, 204
sleep problems 209-211
slow wave sleep 169, 185
social factors 207, 209
soybeans 32
spectrum of biological rhythms 32
spontaneous optic nerve impulse 57
stomatal aperture 35, 40
subcellular circadian rhythmicity 4
suprachiasmatic nucleus (SCN) 2, 77,97, 99, 100, 139, 375
Synechococcus sp. 3, 16

T3 124, 127, 129, 131-133, 326
T4 123-126, 131, 132, 326
temperature 174, 176-180
temperature compensation 10, 86
temperature pulses 86, 87, 96
temporal order 68, 76, 107, 108, 114, 115, 117-119
temporal organization 31-34, 37, 67, 263, 266, 268
testosterone 326, 328
thermoregulation 367
thylakoids 26
thyrotropin 367, 371
thyroxine 123, 133, 134
timed feeding 311
timed target gene 10
timing mechanisms 32, 36, 170
tolerance 198, 199, 202, 207, 237, 262, 263, 266, 269-271, 274-276
transducing (coupling) pathways 1
transmembrane calcium flux 55, 63, 64
transmission of circadian information 70
transmucosal potential difference 299
transplantation of the optic lobe 72
transplanted oscillator 72
treatment of
  affective illness 367
  angina pectoris 233
  cancer 262, 268, 271
  cardiovasc. disease 223, 237
  depression 137
  jetlag 144
  hypertension 220, 234, 236
  nocturnal asthma 256
trend def. 345
trifluoperazine 12, 22, 24, 26
Trifolium repens 11
triiodothyronine 124, 133, 134
tumor cytokinetics 262
tunicamycin 25, 27
turgor variations 33
two oscillator model 101
tyrosine 34, 97, 99

ulcerative colitis 307, 308
ulcerogenic agent 309
ulcerogenic theory 295, 303
ultradian 1, 4, 5, 8, 9, 11, 31-33, 36, 44, 107-111, 114, 115, 117, 119, 261, 268, 274, 291, 308, 337-339, 369
ultradian clocks 1
unit activity 73-76, 101
urine volume 221, 222, 338

vasoactive intestinal polypeptide (VIP) 2, 98
vernalized radishes 34
vertebrates 9, 43, 48, 55, 67, 144, 338
visual system 97, 98
voltage sensitive calcium channels 64

wakefulness 183-187, 191, 197, 265, 274, 342, 359, 369, 371, 375
water vapor 32
waveform def. 345
wild-type CRs 5
wild-type DNA 44

Zeitgeber 1, 85, 86, 89, 111, 142, 150, 152, 154, 156, 158, 164, 166, 169, 170, 174, 199
Zollinger-Ellison syndrome 302